University of Vermont
Department of Physics

Physics 242: Introduction to Solid State Physics

Fall 2022

Instructor:	Dr. Dennis Clougherty	**Time:**	MWF 9:40-10:30 AM
Email:	dennis.clougherty+PHYS242@uvm.edu	**Place:**	Lafayette L406

Course Description: Introduction to crystal structures, reciprocal lattices, lattice vibrations. Thermal properties of solids and free electron theory of metals and semiconductors. Elementary band theory and introduction to electronic transport theory.

Prerequisites: PHYS 128.

Objectives: Using semiclassical models, students will develop an understanding of the fundamental properties of crystalline solids.

Course Personnel:

Ms. Beth Stinebring, administrative assistant (beth.stinebring@uvm.edu).
Mr. Andrew Lewis, graduate teaching assistant (andrew.lewis@uvm.edu)

Office Hours: W 3:15-3:50 PM & by appointment.

References:

1. C. Kittel, *Introduction to Solid State Physics*, 8th edition, (Wiley, 2004). (This is the required text for the course.)
2. S. Girvin and K. Yang, *Modern Condensed Matter Physics*, (Cambridge University Press, 2019). (This is a new text with a treatment of research topics of contemporary interest in condensed matter systems.)
3. N. Ashcroft and D. Mermin, *Solid State Physics* (This is a standard text at the graduate level.)
4. M. Ali Omar, *Elementary Solid State Physics* (An introduction to solid state physics at an elementary level.)
5. M. Marder, *Condensed Matter Physics* (A comprehensive treatment for the advanced student.)

Online Resources:

1. Course web site: `http://bb.uvm.edu`
2. UVM Physics help sessions web site: `https://www.uvm.edu/cas/physics/help-sessions`
3. UVM tutoring center web site: `https://www.uvm.edu/academicsuccess/tutoring_center`
4. UVM Physics web site: `http://www.uvm.edu/physics/`
5. UVM student accessibility services (SAS): `http://www.uvm.edu/access`
6. Prof. Clougherty's web site: `http://go.uvm.edu/dpc/`

Course Outline:

1. Crystal Structure
2. The Reciprocal Lattice
3. Phonons
4. Fermi Gas
5. Band Structure
6. Semiconductors
7. Metals
8. Excitations of Solids
9. Optical Properties of Solids

Grading Policy:

Homework (30%), Exams (15% each), Final (25%).

Important Dates:

Exam #1	September 21, 2022
Exam #2	October 19, 2022
Exam #3	November 16, 2022
Final Exam	December, 2022

Please mark these dates in your calendar now. Exams will take precedence over medical appointments, travel plans, athletic events, and other personal activities. If you miss an exam, you will receive a score of zero unless excused by Professor Clougherty prior to the exam. As a general rule, only a verifiable illness is reason to miss an exam.

Class expectations:

1. *Attendance*: Regular attendance is important in mastering the material.
2. *Preparation*: Students are required to read the assigned text in advance of class. Please come to class with questions stimulated by your readings.
3. *Homework*: Homework assignments will be posted to the course web site on Blackboard. Please write up your complete and detailed solutions neatly. Please upload a scanned pdf of your solution to Blackboard in advance of the posted deadline.
4. *Exams*: Exams will be based on the homework problems. Exams are closed-book, but you can bring a single-page sheet with notes to use during the exam.
5. *Class recordings*: Our class sessions may be recorded for students in the class to refer back to, and for enrolled students who are unable to attend live. Students who participate online with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who unmute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live.

Accommodations: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course. See http://www.uvm.edu/access for more information.

Academic Integrity: It is expected that all students will adhere to the University code of academic integrity. Students are prohibited from publicly sharing or selling academic materials that they did not author (for example: class syllabus, outlines or class presentations authored by the professor, practice questions, text from the textbook or other copyrighted class materials, etc.); and students are prohibited from sharing assessments (for example, homework or a take-home examination). Violations will be handled under UVMs Intellectual Property policy and Code of Academic Integrity.

(https://www.uvm.edu/sites/default/files/UVM-Policies/policies/acadintegrity.pdf)